Simulation of the process of crystal surfaces chemical polishing

A. V. Yukhnevich, I. A. Mayer, A. E. Usenka
Research Institute for Physical Chemical Problems, Belarusian State University, Minsk, Belarus
e-mail: yukhnevich@bsu.by

Chemical polishing of the surface is used in many fields of science and technology. In particular, the process is applied in the manufacture of miniaturized devices on the basis of single-crystal silicon (e. g. MEMS, NEMS). As devices are scaled down to the nanosize, the formation of more and more high-quality surfaces is required, up to obtain atomically smooth topography [1, 2]. Modern technologies can not provide the formation of a surface with the required quality for advanced silicon devices. One of the most promising ways to study and improve the process of chemical polishing is to simulate it at the atomic level and to identify the ways of developing the theory and technology of monocrystalline surface treatment by comparing the simulation results with the desired structure of the surface [3, 4]. We have outlined the ways of forming a perfect surface Si(001) using an improved atomic dissolution model of diamond-like crystals (Figure). The model takes into account the effect of the second indirect neighbors on the rate of surface atoms removal.

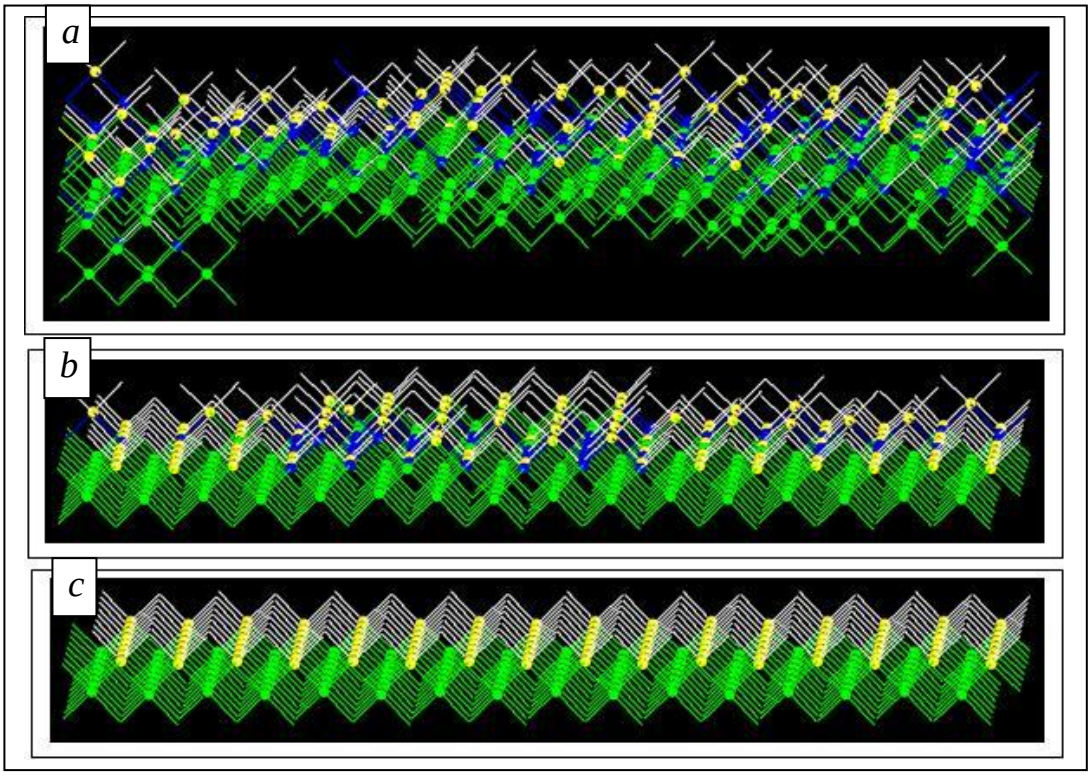

Fig. An operation example of the new model:
a – rough surface (001); *b* – surface *a* after the partial polishing;
c – perfect surface (001) after the finishing polishing of surface *a*

References

1. M. Kolmer et al. *Appl. Surf. Sci.* (2014) 288: 83.
2. M. A. Cullinan et al. *Sensors a. Actuators A.* (2012) 187: 162.
3. M. A. Gosalvez et al. *J. Micromech. Microeng.* (2008) 18: 1.
4. A. V. Yukhnevich, I. A. Mayer, A. E. Usenka. *Theor. a. Appl. Mech.* (2013) 28: 123.